

Reconstruction of the North Atlantic end-member of the Atlantic Meridional Overturning Circulation over the last 2 Myr

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North Atlantic Deep Water (NADW) represents the major water mass that drives the Atlantic Meridional Ocean Circulation (AMOC), which undergoes substantial reorganization with changing climate. In order to understand its impact on ocean circulation and climate through time, it is necessary to constrain its composition. We report Nd isotope ratios of Fe-Mn oxide encrusted foraminifera from DSDP Site 607 (41.00N 32.96W, 3427m), in the present-day core of NADW. We provide a new North Atlantic paleocirculation record covering the last 2 Myr.

Results for the last 2 Myr show that Site 607 interglacial ϵ_{Nd} -values are consistently similar to present-day NADW ($\epsilon_{Nd} \sim -13.5$), with median ϵ_{Nd} -values of -14.2 and -13.9 in the early and mid-late Pleistocene. Glacial ϵ_{Nd} -values are higher by ~ 1 ϵ_{Nd} -unit in the early Pleistocene, and ~ 2 ϵ_{Nd} -units in the mid-late Pleistocene.

We interpret the North Atlantic AMOC source as represented by the Site 607 interglacial ϵ_{Nd} -values, which has remained nearly stable throughout the entire period. Glacial ϵ_{Nd} -values reflect incursions of southern-sourced waters to Site 607, which is supported by coeval shifts to lower benthic $\delta^{13}C$.

A period of greatly disrupted ocean circulation marks ~ 950 -850 Ma, which may have been triggered by enhanced ice growth in the Northern Hemisphere that began around ~ 1.2 Ma, as suggested by possible input events of Nd from the surrounding cratons into the North Atlantic observed in Site 607. Interglacial AMOC only recovers to the previously observed vigor over ~ 200 kyr following the disruption, whereas further intensified SSW incursion into the deep North Atlantic come to characterize the mid-late Pleistocene glacial intervals.